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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/823,196	04/12/2004	Kiran Kumar Kuchi	875.0132.U1(US)	4038

29683 7590 01/05/2009
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EXAMINER	
NGUYEN, LEON VIET Q	

ART UNIT	PAPER NUMBER
2611	

MAIL DATE	DELIVERY MODE
01/05/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

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DETAILED ACTION

1. This office action is in response to communication filed on 10/23/08. Claims 64 and 65 have been added. Claims 1, 13-16, 18, 19, 25-39, 41-58 and 60-65 are pending on this application.

Response to Arguments

2. Applicant's arguments filed 10/23/08 regarding claims 1 and 42 have been fully considered but they are not persuasive.

3. Applicant's arguments with respect to claims 18 and 19 have been considered but are moot in view of the new ground(s) of rejection.

Response to Remarks

Regarding claim 1, applicant asserts that Zhang does not disclose "performing on a corresponding complex composite base band received signal, comprised of real modulation signals, complex modulation signals or a combination of real and complex modulation signals, a joint detection in inphase domain and quadrature domain of a real modulation alphabet and a complex modulation alphabet wherein the joint detection includes at least one of channel-shortening, joint pre-filtering and joint reduced state sequence detection" (Remarks page 14 third paragraph).

Examiner respectfully disagrees.

As stated in the previous office action, the system of Zhang utilizes EDGE, which is a type of GSM modulation scheme that uses 8-PSK encoding (page 541, left side, second paragraph). It is well known to those of ordinary skill in the art that PSK techniques send signals over baseband channels with the signals being of the form z(t) = I(t) + jQ(t) where *I*(*t*) is the inphase signal, *Q*(*t*) the quadrature phase signal, and *j* the imaginary unit. I(t) is considered the "real" portion of the signal and Q(t) is considered the "complex" portion of the signal.

Furthermore, claim 1 states "wherein the joint detection includes **at least one of (emphasis added)** channel-shortening, joint pre-filtering and joint reduced state sequence detection." Zhang teaches a Joint Reduced-state Sequence estimator JRSSE in fig. 1. Nowhere in the reference does Zhang teach that the receiver of fig. 1 is intended for a computer simulation. Moreover it is well known that PSK is a digital modulation technique which may employ pilot or training symbols for synchronization (see ¶0043 of Olsson et al US20050111596).

Further regard claim 1, applicant asserts that Olsson is silent on "determining… whether operation of the receiver is in a first mode in which an interfering signal is directed to a different receiver" (Remarks page 16 last paragraph).

Examiner respectfully disagrees.

It is first noted that claim 1 reads "determining **at least one of (emphasis added)**...whether operation of the receiver is in a second mode in which a desired signal and an interfering signal are processed by the receiver". Olson teaches an

receiver using a single antenna interference rejection method (fig. 1). The receiver is part of a GSM/EDGE system that receives a desired GMSK modulated signal and an interfering 8PSK modulated signal (fig. 14, ¶0028). Since there is a single receiver, it would be obvious that the receiver process both the desired and interfering signal as taught by Olsson. This is interpreted to read on the limitation as claimed.

Applicant also asserts that the combination of Zhang and Olsson would have unexpected results (Remarks page 17 second paragraph).

In response to applicant's argument that the resulting combination would have unexpected results, the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981).

Regarding the arguments of the rejection of claims 42, 62, and 63 see the response to the arguments of claim 1 above.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the

> art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

5. Claims 64 and 65 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

In claims 64 and 65, a computer-readable storage medium having computer-executable instructions was not described in the specification.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1, 29-33, 36, 38, 41-43, 48-52, 55, 57, and 60 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhang et al ("Reduced-State MIMO sequence estimation for EDGE systems" Signals, Systems and Computers, 2002. Conference Record of the Thirty-Sixth Asilomar Conference, 3-6 Nov. 2002, Volume 1 page(s): 541- 545) in view of Olsson et al (US20050111596).

Re claim 1, Zhang teaches a method comprising:

receiving a wireless communication signal by a receiver from each of at least two spatially separated transmit antennas associated with at least one transmitter or from at

least two transmitters (page 541, right side, last paragraph. M transmit and N receive antenna); and

performing on a corresponding complex composite base band received signal (page 541, left side, second paragraph. The system is used in an EDGE system with 8PSK modulation. It is well known in the art that 8-PSK modulated signals are composite baseband signals comprising an in-phase component, or real, and a quadrature component, or imaginary), comprised of real modulation signals, complex modulation signals or a combination of real and complex modulation signals, a joint detection in inphase domain and quadrature domain of a real modulation alphabet and a complex modulation alphabet (It is well known in the art that 8-PSK modulated signals are composite baseband signals comprising an in-phase component, or real, and a quadrature component, or imaginary. Also see the response to the remarks above) wherein the joint detection includes at least one of channel-shortening, joint pre-filtering and reduced state sequence detection of real and imaginary parts of signals (page 542, right side, first paragraph. fig. 1), from a single receive antenna branch or from a plurality of receive antenna branches (it would be necessary to perform the process on at least one antenna branch), separately to filter out noise plus residual interference across in-phase and quadrature branches (it is well known in the art that filters are used for reducing noise and interference).

Zhang fails to teach determining at least one of whether operation of the receiver is in a first mode in which an interfering signal is directed to a different receiver; and

whether operation of the receiver is in a second mode in which a desired signal and an interfering signal are processed by the receiver. However Olsson teaches determining whether operation of the receiver is in a first mode in which an interfering signal is directed to a different receiver (fig. 14, ¶0028) or in a second mode in which a desired signal and an interfering signal are processed by the receiver (fig. 13, ¶0027, in GMSK-GMSK modulation schemes both signals are processed as data. Also see the response to remarks above). It would be obvious to determine the operation mode to decide which interference method to utilize.

Therefore taking the combined teachings of Zhang and Olsson as a whole, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the method of Olsson into the method of Zhang. The motivation to combine Zhang and Olsson would be to eliminate the degradation in 8PSK-modulated interference and give a large gain over a conventional receiver (¶0063).

Re claim 29, the modified invention of Zhang teaches a method where joint pre-filtering comprises using a set of feed forward weights (page 542, right side, first paragraph of Zhang, equation 6 of Zhang. W^H is a matrix comprising pre-filter weights) to minimize an error term (page 542, right side, first paragraph of Zhang, equation 6 of Zhang) that includes an I-Q MIMO feedback filter (page 542, right side, first paragraph of Zhang, equation 6 of Zhang. B^H is a matrix comprising feed back filter weights),

wherein a feed forward filter separately filters real and imaginary parts of baseband data collected from at least one receive antennas (it is well known that a filter would filter the imaginary and real part of an 8PSK modulated signal).

Re claim 30, the modified invention of Zhang discloses a method where joint pre-filtering comprises optimizing filter coefficients according to a MMSE criterion (page 542, right side, first paragraph of Zhang, equation 7 of Zhang).

Re claim 31, the modified invention of Zhang discloses a method where reduced state sequence detection comprises use of a reduced state soft output sequence estimation (JRSSE in fig. 1 of Zhang) to jointly detect I-Q symbol streams that employs a branch metric comprised of I-Q components of the composite signal (page 541, left side, second paragraph of Zhang. The system is used in an EDGE system with 8PSK modulation. It is well known in the art that 8-PSK modulated signals are composite baseband signals comprising an in-phase component, or real, and a quadrature component, or imaginary. Since the composite signal comprises of I and Q components, it is interpreted that the I-Q symbol streams of the composite signal are detected).

Re claim 32, the modified invention of Zhang teaches a method configured in an 8PSK blind I-Q interference suppression receiver (¶0042-¶0043 of Olsson, the blind modulation detection of a desired signal. Also in an EDGE system, signals of either GMSK or 8PSK modulation are present) when a GMSK interferer is present (¶0043 of Olsson, an interferer is GMSK-modulated).

Re claim 33, the modified invention of Zhang teaches an I-Q MIMO MMSE joint detection receiver (abstract of Zhang) configured in GMSK-8PSK or 8PSK-GMSK (fig. 14 of Olsson, ¶0028 of Olsson. The desired signal is GMSK modulated and the interferer is 8PSK modulated).

Re claim 36, the modified invention of Zhang teaches a method further comprising sequentially estimating desired and dominant interfering signal channel impulse responses (page 542, right side, first paragraph of Zhang. It would be obvious to one of ordinary skill in the art that the impulse response be estimated before it is shortened and reshaped. Furthermore it is well known in the art that in joint equalization systems, data and interference are both detected), where channel estimation blindly identifies a dominant interferer modulation type (¶0043-¶0044 of Olsson) and its training sequence (¶0042 of Olsson).

Re claim 38, the modified invention of Zhang teaches a method where identifying the signal modulation type and training sequence comprises searching through known training sequences (¶0042 of Olsson, the position and content of the training sequence is well known. Furthermore it is well known in the art that the training sequence incoming of an incoming signal is compared to known training sequences to achieve synchronization), and analyzing residual signals to identify a type of dominant interference (¶0044 of Olsson, decision mechanism 18 in fig. 7).

Re claim 41, the modified invention of Zhang teaches a method wherein in the first mode, the interfering signal is to be discarded (¶0063 of Olsson, the 8PSK-modulated interference is eliminated).

Re claim 42, the claimed limitations recited have been analyzed and rejected with respect to claim 1. Zhang teaches the device (fig. 1 of Zhang) as taught by the method.

Re claim 43, the modified invention of Zhang teaches a device where said receiver is coupled to a plurality of receive antennas (fig. 1 of Zhang, receive antennas 1 to N).

Re claim 48, the claimed limitations recited have been analyzed and rejected with respect to claim 29.

Re claim 49, the claimed limitations recited have been analyzed and rejected with respect to claim 30.

Re claim 50, the claimed limitations recited have been analyzed and rejected with respect to claim 31.

Re claim 51, the claimed limitations recited have been analyzed and rejected with respect to claim 32.

Re claim 52, the claimed limitations recited have been analyzed and rejected with respect to claim 33.

Re claim 55, the claimed limitations recited have been analyzed and rejected with respect to claim 36.

Re claim 57, the claimed limitations recited have been analyzed and rejected with respect to claim 38.

Re claim 60, the claimed limitations recited have been analyzed and rejected with respect to claim 41.

3. Claims 13-16, 18, 19 and 61 are rejected under 35 U.S.C. 103(a) as being unpatentable over Olsson et al (US20050111596) in view of Zhang et al ("Reduced-State MIMO sequence estimation for EDGE systems" Signals, Systems and Computers, 2002. Conference Record of the Thirty-Sixth Asilomar Conference, 3-6 Nov. 2002, Volume 1 page(s): 541- 545).

Re claim 18, Olsson teaches a wireless transmission system comprising:

at least one base station (base stations 2 in fig. 15) and at least one RF unit for transmitting one of a GMSK and an 8PSK transmission signal (¶0063, the desired signal is GMSK modulated which means that the antenna transmits a GMSK transmission signal);

at least one receiving station (mobile unit 4 in fig. 15), having at least one antenna (it is well known that mobile units in a wireless communications system have an antenna to receive signals from a base station), for communicating with said base station;

where said receiving station comprises means for applying interference cancellation to a composite input signal comprising a combination of a first signal and a second signal interfering with said first signal (¶0063, the GMSK modulated signal is the first signal and a 8PSK modulated signal is an interfering signal), thereby reducing interference between said first signal and said second signal (¶0063, the degradation in 8PSK modulated interference is eliminated), in which said receiving station comprises means for evaluating the modulation type of an interfering signal (¶0044) and for estimating channel parameters of said interfering signal (¶0042, ¶0051, channel estimation is performed and the SNR is the channel parameter);

in which said channel parameters of said interfering signal are estimated by calculating channel parameters for all combinations of a desired signal and of said interfering signal (¶0042) and selecting the channel parameters that meet a criterion (¶0051, the SNR that is larger than a first threshold).

Olsson fails to teach wherein the base station has at least two spatially separated antennas. However one of ordinary skill in the art would have found it obvious to utilize spatial diversity to increase the quality and reliability of the wireless link.

Olson also fails to teach performing on a corresponding complex composite base band received signal, comprised of real modulation signals, complex modulation signals or a combination of real and complex modulation signals, a joint detection in inphase domain and quadrature domain of a real modulation alphabet and a complex modulation alphabet wherein the joint detection includes at least one of channel-shortening, joint pre-filtering and joint reduced state sequence detection. However It is well known to those of ordinary skill in the art that PSK techniques used in EDGE systems send signals over baseband channels with the signals being of the form z(t) = I(t) + jQ(t) where *I*(*t*) is the inphase signal, *Q*(*t*) the quadrature phase signal, and *j* the imaginary unit. I(t) is considered the "real" portion of the signal and Q(t) is considered the "complex" portion of the signal.

Also, Zhang teaches wherein the joint detection includes joint reduced state sequence detection (the Joint Reduced-state Sequence estimator JRSSE in fig. 1)

Therefore taking the combined teachings of Olsson and Zhang as a whole, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the feature of Zhang into the system of Olsson. The motivation to combine Zhang and Olsson would be to efficiently and effectively decouple spatial and temporal processing (abstract of Zhang).

Re claim 13, the modified invention of Olsson fails to explicitly teach a system in which said base station transmits two transmission signals on the same channel. However Olsson teaches wherein the system transmit a desired GMSK-modulated

signal and an 8PSK-modulated signal (¶0063 of Olsson) which results in co-channel interference (¶0034 of Olsson). It is well known in the art that co-channel interference is crosstalk from two different radio transmitters reusing the same frequency channel.

Re claim 14, the modified invention of Olsson teaches a system in which said two transmissions signals comprise two GMSK signals (fig. 13 of Olsson, ¶0027 of Olsson).

Re claim 15, Olsson teaches a system in which said two transmissions signals comprise two 8PSK signals (¶0042 of Olsson, Olsson suggests an EDGE system which receives 8PSK-modulated signals and no GMSK signal. One of ordinary skill in the art would have found it obvious to receive two 8PSK signals).

Re claim 16, the modified invention of Olsson teaches a system in which said two transmissions signals comprise one 8PSK signal and one GMSK signal (fig. 14 of Olsson, ¶0028 of Olsson).

Re claim 19, Olsson teaches a wireless transmission system comprising:

at least one base station having at least one antenna (base stations 2 in fig. 15) and at least one RF unit for transmitting one of a GMSK and an 8PSK transmission signal (¶0063, the desired signal is GMSK modulated which means that the antenna transmits a GMSK transmission signal);

at least one receiving station (mobile unit 4 in fig. 15), having at least one antenna (it is well known that mobile units in a wireless communications system have an antenna to receive signals from a base station), for communicating with said base station;

where said receiving station comprises means for applying interference cancellation to a composite input signal comprising a combination of a first signal and a second signal interfering with said first signal (¶0063, the GMSK modulated signal is the first signal and a 8PSK modulated signal is an interfering signal), said receiving station configured to perform on a corresponding complex composite base band received signal, comprised of real modulation signals, complex modulation signals or a combination of real and complex modulation signals, a joint detection in inphase domain and quadrature domain of a real modulation alphabet and a complex modulation alphabet (It is well known to those of ordinary skill in the art that PSK techniques used in EDGE systems send signals over baseband channels with the signals being of the form z(t) = I(t) + jQ(t) where *I*(*t*) is the inphase signal, *Q*(*t*) the quadrature phase signal, and *j* the imaginary unit), in which said receiving station comprises means for evaluating the modulation type of an interfering signal (¶0044) and for estimating channel parameters

of said interfering signal (¶0042, ¶0051, channel estimation is performed and the SNR is the channel parameter); and

further comprising means for detecting at least one of the following:

whether said system is in a first transmission mode in which said interfering signal is directed to a different receiver (fig. 14, ¶0028, ¶0063) and whether said system is in a second transmission mode in which said first signal and said second signal are both to be processed by the receiving station (fig. 13, ¶0027, in GMSK-GMSK modulation schemes both signals are processed as data); and

processing said second signal in accordance with said detected transmission mode (¶0036).

Olsson fails to teach alphabet wherein the joint detection includes at least one of channel-shortening, joint pre-filtering and joint reduced state sequence detection. However Zhang teaches wherein the joint detection includes joint reduced state sequence detection (the Joint Reduced-state Sequence estimator JRSSE in fig. 1)

Therefore taking the combined teachings of Olsson and Zhang as a whole, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the feature of Zhang into the system of Olsson. The motivation to combine Zhang and Olsson would be to efficiently and effectively decouple spatial and temporal processing (abstract of Zhang).

Re claim 61, the modified invention of Olsson teaches a system in which two transmission signals are transmitted by the same base station using two antennas or are transmitted by a plurality of base stations each using one antenna (fig. 15 of Olsson).

4. Claims 25-28, 34, 35, 44-47, 53, and 54 rejected under 35 U.S.C. 103(a) as being unpatentable over Zhang et al ("Reduced-State MIMO sequence estimation for EDGE systems" Signals, Systems and Computers, 2002. Conference Record of the Thirty-Sixth Asilomar Conference, 3-6 Nov. 2002, Volume 1 page(s): 541-545) and Olsson et al (US20050111596) in view of Onggosanusi et al (US20040192215).

Re claim 25, the modified invention of Zhang fails to teach a method where the real modulation signal is a GMSK signal, and where receiving includes rotating the received signals in complex space such that the GMSK signal is binary modulated.

However Onggosanusi teaches where the real modulation signal is a GMSK signal (¶0039-¶0040, ¶0045), and where receiving includes rotating the received signals in complex space (block 510 in fig. 5, ¶0044) such that the GMSK signal is binary modulated (¶0040-¶0043. a_k is modulated using binary phase shift keying).

Therefore taking the modified teachings of Zhang and Olsson with Onggosanusi as a whole, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the method of Onggosanusi into the method of

Zhang and Olsson. The motivation to combine Onggosanusi, Olsson and Zhang would be to provide an additional degree of freedom to assist in interference cancellation (¶0042).

Re claim 26, the modified invention of Zhang fails to teach a method where the base band received signal is a sum comprised of at least one GMSK signal, further comprising de-rotating the base band received signal with a factor $e^{-j\Phi k}$ such that the component GMSK signal is forced to be binary modulated.

However Onggosanusi teaches where the base band received signal is a sum comprised of at least one GMSK signal (¶0039-¶0040, ¶0045), further comprising de-rotating the base band received signal with a factor $e^{-j\Phi k}$ (¶0044. $-j^{m+1}$ is equivalent to $e^{-j\Phi k}$) such that the component GMSK signal is forced to be binary modulated.

Therefore taking the modified teachings of Zhang and Olsson with Onggosanusi as a whole, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the method of Onggosanusi into the method of Zhang and Olsson. The motivation to combine Onggosanusi, Olsson and Zhang would be to provide an additional degree of freedom to assist in interference cancellation (¶0042).

Re claim 27, the modified invention of Zhang teaches a method further comprising splitting the I and Q parts of the de-rotated base band signal (block 515 in fig. 5 of Onggosanusi, ¶0044 of Onggosanusi).

Re claim 28, the modified invention of Zhang teaches a method further comprising de-rotating (block 510 in fig. 5 of Onggosanusi) and I-Q splitting the base band signal (block 515 in fig. 5 of Onggosanusi) to yield modulation formats comprising binary, real and imaginary data streams (¶0042 and equation (1) of Onggosanusi).

Therefore taking the modified teachings of Zhang and Olsson with Onggosanusi as a whole, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the method of Onggosanusi into the method of Zhang and Olsson. The motivation to combine Onggosanusi, Olsson and Zhang would be to provide an additional degree of freedom to assist in interference cancellation (¶0042).

Re claim 34, the modified invention of Zhang teaches a method configured in an I-Q MIMO MMSE receiver (fig. 1 of Zhang) that jointly detects two 8PSK signals (¶0042 of Olsson, Olsson suggests an EDGE system which receives 8PSK-modulated signals and no GMSK signal. One of ordinary skill in the art would have found it obvious to received two 8PSK signals) and rejects residual interference (the feed-forward and feedback filters in fig. 1 of Zhang). However Zhang fails to teach jointly detecting two 8PSK signals and rejecting GMSK interference using I-Q whitening.

Ongggosanusi teaches using whitening to reject residual interference (block 525 in fig. 5, ¶0063).

Therefore taking the modified teachings of Zhang and Olsson with Onggosanusi as a whole, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the method of Onggosanusi into the method of Zhang and Olsson. The motivation to combine Onggosanusi, Olsson and Zhang would be to reduce the coloring of the interference signal, which can severely impact performance (¶0063).

Re claim 35, the modified invention of Zhang teaches a method configured in an I-Q MIMO MMSE receiver (fig. 1 of Zhang) that jointly detects two GMSK signals (¶0027 of Olsson, fig. 13 of Olsson) and rejects residual interference using I-Q whitening (the feed-forward and feedback filters in fig. 1 of Zhang). However Zhang fails to teach jointly detecting two GMSK signals and rejecting GMSK and 8PSK interference using I-Q whitening.

Ongggosanusi teaches using whitening to reject residual interference (block 525 in fig. 5, ¶0063).

Therefore taking the modified teachings of Zhang and Onggosanusi as a whole, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the method of Onggosanusi into the method of Zhang and Olsson. The motivation to combine Onggosanusi, Olsson and Zhang would be to reduce the coloring of the interference signal, which can severely impact performance (¶0063).

Re claim 44, the claimed limitations recited have been analyzed and rejected with respect to claim 25.

Re claim 45, the claimed limitations recited have been analyzed and rejected with respect to claim 26.

Re claim 46, the claimed limitations recited have been analyzed and rejected with respect to claim 27.

Re claim 47, the claimed limitations recited have been analyzed and rejected with respect to claim 28.

Re claim 53, the claimed limitations recited have been analyzed and rejected with respect to claim 34.

Re claim 54, the claimed limitations recited have been analyzed and rejected with respect to claim 35.

5. **Claims 37 and 56 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhang et al ("Reduced-State MIMO sequence estimation for EDGE systems" Signals, Systems and Computers, 2002. Conference Record of the Thirty-Sixth Asilomar Conference, 3-6 Nov. 2002, Volume 1 page(s): 541- 545) and Olsson et al (US20050111596) in view of Hafeez et al ("Interference cancellation for EDGE via two-user joint demodulation", Vehicular Technology Conference, 2003. VTC 2003-Fall. 2003 IEEE 58th, Publication Date: 6-9 Oct. 2003, Volume: 2, On page(s): 1025-1029).**

Re claim 37, the modified invention of Zhang teaches a method wherein modulation identification comprises use of $e^{j\pi k/2}$, $e^{j3\pi k/8}$ constellation rotations associated with GMSK and 8PSK modulations (¶0043 of Olsson) but fails to teach where training sequence identification comprises use of an estimation metric over a plurality of possible interference training sequence pairs.

Hafeez teaches where training sequence identification comprises use of an estimation metric over a plurality of possible interference training sequence pairs (page 1027, left side, last paragraph – page 1027 right side first paragraph. The channel estimation error taps are interpreted to be the estimation metric).

Therefore taking the modified teachings of Zhang and Olsson with Hafeez as a whole, it would have been obvious to one of ordinary skill in the art at the time the

invention was made to incorporate the method of Hafeez into the method of Zhang and Olsson. The motivation to combine Zhang, Olsson and Hafeez would be to alleviate the bad cross-correlation properties of the training sequences (page 1027, right side, first paragraph).

Re claim 56, the claimed limitations recited have been analyzed and rejected with respect to claim 37.

6. Claims 39 and 58 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhang et al ("Reduced-State MIMO sequence estimation for EDGE systems" Signals, Systems and Computers, 2002. Conference Record of the Thirty-Sixth Asilomar Conference, 3-6 Nov. 2002, Volume 1 page(s): 541- 545) and Olsson et al (US20050111596) in view of Hafeez et al (US6304618).

Re claim 39, the modified invention of Zhang teach a method comprising sequentially estimating interfering modulation type and training sequence (¶0043-¶0044 of Olsson, the interferer has a training sequence. Therefore if the modulation type is estimated it would be obvious to estimate the training sequence as well) but fails to teach performing a maximum likelihood joint channel estimate after all modulation types and training sequences are estimated.

Hafeez teaches performing a maximum likelihood joint channel estimate after all modulation types and training sequences are estimated (col. 1 lines 23-29, it would be obvious and well known to perform channel estimation after identification of a signal

occurs. The identification and synchronization involve detecting a modulation type and comparing the received training sequence with a known sequence).

Therefore taking the modified teachings of Zhang and Olsson with Hafeez as a whole, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the method of Hafeez into the method of Zhang and Olsson. The motivation to combine Hafeez, Olsson and Zhang would be to reduce the effects of co-channel and inter-symbol interference as well as provide superior performance (col. 1 lines 23-29).

Re claim 58, the claimed limitations recited have been analyzed and rejected with respect to claim 39.

7. **Claims 62 and 63 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhang et al ("Reduced-State MIMO sequence estimation for EDGE systems" Signals, Systems and Computers, 2002. Conference Record of the Thirty-Sixth Asilomar Conference, 3-6 Nov. 2002, Volume 1 page(s): 541- 545) in view of Olsson et al (US20050111596) and further in view of Hafeez et al ("Interference cancellation for EDGE via two-user joint demodulation", Vehicular Technology Conference, 2003. VTC 2003-Fall. 2003 IEEE 58th, Publication Date: 6-9 Oct. 2003, Volume: 2, On page(s): 1025- 1029).**

Re claim 62, Zhang teaches a method comprising

receiving a wireless communication signal by a receiver from each of at least two spatially separated transmit antennas associated with at least one transmitter or from at least two transmitters (page 541, right side, last paragraph. M transmit and N receive antenna);

performing on a corresponding complex composite base band received signal (page 541, left side, second paragraph. The system is used in an EDGE system with 8PSK modulation. It is well known in the art that 8-PSK modulated signals are composite baseband signals comprising an in-phase component, or real, and a quadrature component, or imaginary), comprised of real modulation signals, complex modulation signals or a combination of real and complex modulation signals, a joint detection inphase domain and quadrature domain of a real modulation alphabet and a complex modulation alphabet (It is well known to those of ordinary skill in the art that PSK techniques used in EDGE systems send signals over baseband channels with the signals being of the form z(t) = I(t) + jQ(t) where *I*(*t*) is the inphase signal, *Q*(*t*) the quadrature phase signal, and *j* the imaginary unit) wherein the joint detection includes at least one of channel-shortening, joint pre-filtering and reduced state sequence detection of real and imaginary parts of signals (page 542, right side, first paragraph. fig. 1), from a single receive antenna branch or from a plurality of receive antenna branches (it would be necessary to perform the process on at least one antenna branch); and

sequentially estimating desired and dominant interfering signal channel impulse responses (page 542, right side, first paragraph. It would be obvious to one of ordinary skill in the art that the impulse response be estimated before it is shortened and

reshaped. Furthermore it is well known in the art that in joint equalization systems, data and interference are both detected).

Zhang fails to teach where channel estimation blindly identifies a dominant interferer modulation type and its training sequence, where modulation identification comprises use of $e^{j\pi k/2}$, $e^{j3\pi k/8}$ constellation rotations associated with GMSK and 8PSK modulations, respectively, and where training sequence identification comprises use of an estimation metric over a plurality of possible interference training sequence pairs.

Olsson teaches where channel estimation blindly identifies a dominant interferer modulation type (¶0043-¶0044) and its training sequence (¶0042), where modulation identification comprises use of $e^{j\pi k/2}$, $e^{j3\pi k/8}$ constellation rotations associated with GMSK and 8PSK modulations, respectively (¶0043).

Therefore taking the combined teachings of Zhang and Olsson as a whole, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the method of Olsson into the method of Zhang. The motivation to combine Zhang and Olsson would be to eliminate the degradation in 8PSK-modulated interference and give a large gain over a conventional receiver (¶0063).

Hafeez teaches where training sequence identification comprises use of an estimation metric over a plurality of possible interference training sequence pairs (page

1027, left side, last paragraph – page 1027 right side first paragraph. The channel estimation error taps are interpreted to be the estimation metric).

Therefore taking the combined teachings of Zhang and Hafeez as a whole, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the method of Hafeez into the method of Zhang. The motivation to combine Zhang and Hafeez would be to alleviate the bad cross-correlation properties of the training sequences (page 1027, right side, first paragraph).

Re claim 63, the claimed limitations recited have been analyzed and rejected with respect to claim 62.

Re claim 64, the claimed limitations recited have been analyzed and rejected with respect to claim 62.

Re claim 65, the claimed limitations recited have been analyzed and rejected with respect to claim 63.

Conclusion

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to LEON-VIET Q. NGUYEN whose telephone number is (571)270-1185. The examiner can normally be reached on Monday-Friday, alternate Friday off, 7:30AM-5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David C. Payne can be reached on 571-272-3024. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Leon-Viet Q Nguyen/
Examiner, Art Unit 2611

/David C. Payne/
Supervisory Patent Examiner, Art Unit 2611